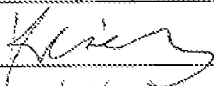## Remarks

Claims 1-6 are pending in the application. Claims 1-6 are rejected. Claim 1 is objected to. All rejections and objections are respectfully traversed. Claim 7 is new. No new subject matter is added.

The specification has been amended to overcome the Examiner's objections. A cross-reference to a related application has been added.

The Examiner states that the declaration is defective for lacking the signature of Wei-Ying Hung. A declaration for Wei-Ying Kung was filed on March 4, 2004. The following was obtained from the USPTO Private PAIR database:

Inventor's Full Name:	Wei-Ying Kung
Inventor's Signature:	
Date:	11/20/2003
Residence: (City, State and/or country)	3740 McClintock Ave. EEB 400 Los Angeles, CA 90089
Citizenship:	Taiwan
Post Office Address:	3740 McClintock Ave. EEB 400 Los Angeles, CA 90089

Applicants respectfully request that the Examiner withdraw this objection.

Claimed is a method for concealing errors in an intra-frame of compressed video. The intra-frame is decoded to multiple macroblocks. Each macroblock includes pixels arranged in a rectangular array. A lost macroblock is identified during the decoding. Each pixel along an outer boundary of the lost macroblock is concealed from a nearest candidate pixel

along an outer boundary of a macroblock immediately adjacent to the lost macroblock. Each other pixel in the lost macroblock is concealed from a nearest candidate pixel selected from a previously concealed pixel in the lost macroblock.

8.   Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Temporal & Spatial Error Concealment Techniques for Hierarchical MPEG-2 Video Codec" (Aign et al.) in view of US Patent Application Publication 2003/0103681

In Aign, *all* pixels in a lost macroblock are interpolated from pixels in four neighboring macroblocks, see page 1780: "The second technique interpolates *each pixel of the whole macroblock* with the adjacent pixels of the four neighbouring macroblocks." The word "*each*" in Aign is interpreted as meaning "*all.*"

Furthermore, Aign states, "*Each* pixel of the current macroblock with the size $2N \times 2N$ will be concealed by simple interpolation of the four pixels of the surrounding macroblocks." This is the identical technique as shown and described for Figure 1 (and labeled Prior Art) in the present application.

Although Guleryuz uses a layered technique, Guleryuz still recovers *all* pixels in the lost block from boundary pixels in neighboring blocks. That is, in Guleryuz, *each pixel* in the entire *lost block* is also recovered from surrounding boundary pixels, see column 2: "*each pixel* in the *lost block* is assigned an initial value … computed from the surroundings of the outer boundary."

The use of the word "*each*" in Guleryuz is also interpreted as meaning "*all*."

Put simply, both methods teach that *each pixel* in the *lost block* is recovered from pixels in surrounding blocks. Thus, Aign and Guleryuz operate in fundamentally and essentially the same way. Thus, Guleryuz cannot cure the defects of Aign, and the combination of Guleryuz and Aign does not make what is claimed obvious.

Also, see Figure 8 of Guleryuz:
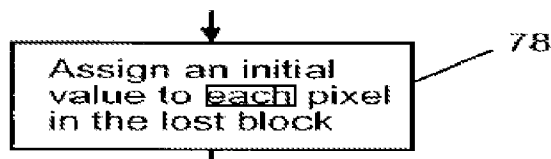
In the case of Guleryuz, *all* pixels of a previous layer are used to conceal *all* of the pixels of the next layer at each stage of the concealing. Furthermore, Guleryuz's concealing is mean-based.

The Examiner states that "it would have been an obvious matter of design choice to recover pixels in a spiral order." The Examiner provides no support for this assertion. The Examiner goes on to state that the Guleryuz pixels can be recovered in a spiral order. This is incorrect. Guleryuz requires processing of all pixels in a previous layer to recover the current layer, see Equation (5). A spiral processing cannot be used with the projective transform of layers as described by Guleryuz.

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9.   Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aign et al. in view of Guleryuz as applied to claim 1 above, and further in view of "Multi-Directional Interpolation for Spatial Error Concealment" (Kwok. et al.).

With respect to claim 4, Applicants claim:

sorting the candidate pixels C_i in an ascending order in terms of intensity values of the candidate pixels;

determining a median value of the ordered candidate pixels;

determining a difference $Diff_i$ between the intensity value of the ith candidate pixel and the median intensity value;

determining a distance $Dist_i$ between the ith candidate pixel and the current pixel;

determining an evaluation score S_i for the ith candidate pixel as sum of $Diff_i$ and $Dist_i$;

if the evaluation score S_i is greater than a threshold T, then rejecting the ith candidate pixel; and

linearly interpolating remaining candidate pixels and assign an interpolated value to the current pixel p according to

$$p = (\sum_i \frac{C_i}{Dist_i})/(\sum_i \frac{1}{Dist_i}).$$

The Examiner, in a rather lengthy analysis, does not consider any the above limitations:

> Regarding claim 4, equation 2 of Aign et al. shows an interpolation method that assigns weights according to the distance of each candidate pixel and the current pixel. If certain macroblocks are not available for interpolation, they can be ignored, as shown

This is not what is claimed.

> of a picture. Regarding claim 4, first, an initial value of the missing macroblock is set, such as the mean value of the pixels surrounding the missing block, another value derived from statistical analysis of the surrounding pixels, or a predetermined constant [0032]. The pixels are recovered using transforms over a target layer in the missing block, and quantized using a hard threshold [0032]. The process is selectively iteratively repeated using a smaller threshold [0033]. However, Guleryuz uses thresholding to further refine initial estimates for lost pixels, not to eliminate extraneous factors at the beginning of an interpolation calculation.

This does not describe the limitations of claim 4.

> Kwok et al. discloses a method for spatial interpolation of lost pixels in an image using smoothing across many directions. First, edges that pass through a missing pixel block are determined (section 3.1). This is done by finding gradient measures for pixels bounding the missing block in eight directions. Then, a voting system determines which directions have the highest gradient values over all the surrounding pixels. The directions that have a total gradient value within a certain threshold value are kept, and the pixels in the missing block are spatially interpolated over the chosen directions (section 3.2), using the same equation as Aign et al.

This does not analyze or address the claimed sorting of pixels, determining a median value, determining a difference, determining a distance, determining an evaluation score, and linearly interpolating steps of claim 4. The Examiner has completely ignored the limitations of claim 4. The rejection of claim 4 is improper.

Claims 5 and 6 depend on allowable claim 4.

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicants' attorney at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
Mitsubishi Electric Research Laboratories, Inc.

By

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